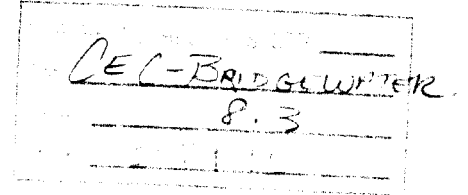


CANNONS ENGINEERING CORPORATION
BRIDGEWATER, MASSACHUSETTS SUPERFUND SITE
FIVE YEAR REVIEW



JUNE 1995

I. Introduction

Authority Statement and Purpose Pursuant to Section 121 (c) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), as amended; Section 300.430 (f) (4) (ii) of the National Oil and Hazardous Substances Pollution Contingency Plan; and OSWER Directives 9355.7-02 (May 23, 1991) and 9355.7-02A (July 26, 1994), reviews (no less than every five years) are mandated for all remedial actions which result in any hazardous substances remaining at levels which will not allow unlimited use and unrestricted exposure at a site. This is a statutory review. The purpose of such review is to ensure that a remedial action remains protective of public health and the environment and is functioning as designed. This document will become a part of the Cannons Bridgewater Site file.

The specific goals of this review are two-fold, as stated in OSWER Directive 9355.7-02: "(1) to confirm that the remedy as spelled out in the ROD and/or remedial design remains effective at protecting human health and the environment (e.g., the remedy is operating and functioning as designed, institutional controls are in place and are protective), and (2) to evaluate whether original cleanup levels remain protective of human health and the environment." The scope of this review meets the Level 1 criteria as set forth in the guidance referenced above. This review included the following documents as sources of information: Remedial Investigation and Feasibility Study Reports (inclusive), Record of Decision, Cannons Engineering Corporation Partial Consent Decree, Remedial Design and Remedial Action Workplans, Remedial Action Report, and Long Term Monitoring Reports.

Site Characteristics The Cannons Engineering Corporation, Bridgewater (CEC) Site is located on First Street in a small industrial park in the western part of the Town of Bridgewater, Plymouth County, Massachusetts. Prior to 1969, the industrial park consisted of a wooded lowland bordered to the north, south and east by rural agricultural land. The Site occupies approximately 4 acres of land. Current land use in the immediate vicinity of the Site consists of industrial development to the north and east, vacant industrial lots to the south and a major four lane highway to the west. The Site was purchased by the CEC company in 1974 and developed to handle, store, and incinerate chemical wastes. The Site locus is shown in Figure 1. The facility operated from 1974 to 1980, when the State of Massachusetts revoked its license to operate because of alleged hazardous waste reporting and handling violations. In December 1982, the Site was added to the National Priorities List (NPL).

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There are three other Superfund sites in Region 1 related to the Bridgewater Site. The Cannons Plymouth Site is in Plymouth, Ma; the Tinkham Garage Site is in Londonderry, NH; and the Gilson Road Site is in Nashua, NH. The Plymouth Site was deleted in September 1992.

II. Remedial Objectives and Response Actions

Selected Remedy In March 1988, a Record of Decision (ROD) was signed by the U.S. EPA Regional Administrator for the selection of a remedial action for the Site. In summary, the source control portion of the remedy provided for fencing the entire Site area to restrict access, on-site thermal aeration (also known as thermal desorption) of upland area and wet area soils contaminated with volatile organic compounds (VOCs) to cleanup levels established after additional sampling, and off-site incineration of polychlorinated biphenyl (PCB) contaminated soils in excess of 9 parts per million (ppm). In addition, on-site buildings and tanks were to be decontaminated and removed and soils under those structures, along with other soil locations, were to be characterized. Any contaminated soils that were determined to require treatment based on a threat to human health and the environment were to be remediated by one of the selected soil treatment technologies. Impacts to the on-site wetlands as a result of excavation of wetland sediment were to be mitigated through restoration of the affected areas of the wetlands.

The management of migration portion of the remedy includes restricting the use of groundwater at the Site, installing additional monitoring wells, and implementing a water quality monitoring program to observe the presence, distribution and migration of contaminants, if any. The ROD stated that removal and treatment of contaminated soils will eliminate sources of further groundwater contamination and remediation of the low levels of contamination found in the groundwater to meet drinking water standards will occur naturally over time. The groundwater monitoring program will assure that contamination above the Maximum Contaminant Levels (MCLs) does not migrate off-site and that contaminant levels on-site naturally attenuate. The ROD stated that the effects of natural attenuation are expected to reduce contaminants in the groundwater to cleanup target levels in 15 to 20 years.

The ROD also specified as part of the management of migration remedy that institutional controls (e.g., deed and

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land use restrictions) will be required to prevent the use of on-site groundwater for all water use purposes and to protect human health.

The ROD established Wet Area Soil Cleanup Levels based on preventing further groundwater deterioration due to contaminant leaching from soil to groundwater for three contaminants using the Organic Leaching Model (OLM). These three compounds "were selected because they were the only compounds which were ever documented to exceed their respective MCL." These compounds and cleanup levels were benzene, 55 parts per billion (ppb); trichloroethylene (TCE), 71 ppb; and vinyl chloride, 11 ppb. These cleanup levels were to be used to identify discrete locations of the wet area to be excavated and treated. However, the ROD also provided for an alternative remediation strategy whereby the entire wet area would be excavated to a depth of two feet and treated. Sampling after excavation would be done to insure protection of human health and the environment. This alternative was provided based upon the difficulties associated with excavating discrete locations in the wet area and because it was expected that the distribution of VOCs was widespread throughout the wet area as a result of their mobility and solubility in soil and water systems. The data indicated that contamination in the Wet area was restricted to west of the Pond to a depth of less than two feet. The Settling parties chose to perform the alternative remediation strategy, and soil remediation levels based upon leachate contribution to groundwater at the Site boundary were developed as described below for the site during design as required in the ROD.

Design Cleanup Levels Early in the design a groundwater contaminant leaching modeling study was performed by Canonie Environmental (1989), the settling parties' contractor, for the contaminants of concern and results were compared with the promulgated Safe Drinking Water Act standards (MCLs and Maximum Contaminant Level Goals [MCLGs]). Remedial action goals for soils in the source areas were set in order to prevent the migration of the contaminants of concern beyond the perimeter of the site at levels above these standards.

Additional VOCs and SVOCs of concern were identified following post-demolition sampling after the buildings were removed and during actual remediation. The final soil remediation treatment and cleanup levels were established prior to soil excavation. The soil remediation criteria for

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VOCs and SVOCs are summarized in the Site Interim Close Out Report. Table 1 includes the final design soil cleanup levels established for the Remedial Action and groundwater standards for 1989 and 1994.

The ROD specified federal MCLs as appropriate groundwater cleanup targets for the following contaminants identified in the Remedial Investigation: benzene (5 ppb), TCE (5 ppb), and vinyl chloride (2 ppb).

ARARs Review The National Contingency Plan (NCP) requires that applicable or relevant and appropriate Federal criteria, advisories, and guidance and State standards be considered during the evaluation of proposed remedial action alternatives. Environmental laws that are applicable or relevant and appropriate to the selected remedial action at the CEC Site were listed in the 1988 ROD as follows:

- Resource Conservation and Recovery Act (RCRA)
- Toxic Substances Control Act (TSCA)
- Clean Water Act
- Safe Drinking Water Act
- Executive Order 11988 (Floodplain Management)
- Executive Order 11990 (Protection of Wetlands)
- Clean Air Act
- Occupational Safety and Health Administration (OSHA)
- State Superfund Law M.G.L. c. 21E, as amended in 1986

The majority of the ARARs apply only to the demolition and source control portion of the remedial action. They were operable when the active building removal and soils cleanup actions were taking place. The source control remedy implementation, as specified in the ROD, was completed in 1991 and the ARARs pertaining to that portion of the remedy are not reviewed in this Five Year review. The Five Year review is necessary because of potential exposure to groundwater. ARARs pertaining to groundwater, however, currently apply to the Site as a measurement of groundwater protection at the Site boundary. These groundwater ARARs are reviewed in Section IV of this report.

Removals In 1982 the Commonwealth of Massachusetts removed 155,000 gallons of sludge and liquid wastes and approximately 700 drums and incinerated the materials off site. In 1988 EPA and the settling parties provided for the removal and disposal of numerous materials abandoned at the site.

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Remedial Action As specified in the ROD a fence surrounding the Site was erected in 1989 and remains in good condition. On February 8, 1990 cleanup activities were undertaken by the settling parties with oversight from EPA and the Commonwealth of Massachusetts. Four hundred tons of PCB contaminated soil were incinerated off site, 11,300 tons of soils containing VOCs and SVOCs were treated on site, 1,200 tons of steel and 1,300 tons of concrete were shipped for recycling, 360 cubic yards of hazardous debris were sent to an approved disposal facility, and 480 cubic yards of non hazardous debris were shipped to a demolition materials landfill.

Post-excavation confirmatory sampling verified that the remedial design excavation levels were achieved during VOC- and PCB-contaminated soil removal. Post-treatment confirmatory sampling verified that the thermal aeration treatment levels were achieved following VOC-contaminated soil treatment. Almost all of the post treatment confirmatory samples showed no contamination present at detection levels, which were well below the required treatment levels. The remaining samples showed the treatment process met the required treatment levels.

Implementation of these measures resulted in the disturbance and temporary loss of areas classified as wetlands. A wetland restoration program was implemented to mitigate these unavoidable impacts. Two wetland areas and the upland area were graded with 500 cubic yards of clean topsoil brought on-site and seeded with appropriate mixtures to restore the wetland areas and provide erosion and dust control in the upland area.

The cleanup activities were completed in 1990. Sustained vegetative growth in the restored wetlands has been observed during successive long-term monitoring site visits. Additional groundwater monitoring wells were installed in 1990 and Long Term Groundwater Monitoring was initiated in June, 1991. Deed restrictions were placed on the two properties comprising the Site and an Interim Closeout Report was signed by the Regional Administrator in September, 1991. The deed restrictions restrict (prohibit) the use of groundwater for drinking water purposes and restrict the future use of the Site to certain municipal uses or certain private party uses which conform to applicable town zoning regulations for commercial/industrial development in the town. Since the Site is located within

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an existing industrial park that has town supplied drinking water, the future use restrictions are easily met.

Post Remedial Action Activities As a result of the Year Two Review, several additional actions were added to the Long Term Monitoring Plan. Sampling frequency has been increased to semi-annual events for years 3 to 5 instead of annual events as specified in the Long Term Monitoring Plan. A three well cluster (MW-18) has been installed to better monitor the groundwater contamination at a location upgradient of a seep, and additional sampling of sediment and surface water has been initiated to monitor potential discharges of groundwater to a drainage canal on the site. Monitoring program sample locations are shown on Figure 2.

III. Long Term Monitoring

Long-term groundwater monitoring began in June 1991 and has been performed according to the approved Long Term Ground Water Monitoring Plan (Plan) (GEI Consultants, Inc., June 1992). The Settling Parties' contractor collects all samples, including selected EPA split samples. Groundwater, surface water, and sediment samples are collected. Surface water and stream sediment samples are collected at the outlet of Wet Area 1. The ROD also had called for the collection of surface water and sediment samples in the drainage canal, but they were deemed by EPA to be unnecessary following the completion of source control activities due to previously low groundwater concentrations. In December 1994, surface water and sediment sampling was initiated in the drainage canal as a result of the PRP Two Year Review report. When present, seep samples also are collected from the northern slope of Wet Area 1, or standing water samples are collected at the base of this slope. Two years of quarterly sampling were performed through March 1993, followed by semi-annual sampling in the spring and autumn to date. The spring sampling round consists only of selected wells. The fall sampling event includes all wells.

The ROD had called for the long-term groundwater monitoring program to initially include analyses for metals as well as the above-described parameters. However, metals analyses were not required when the Plan was written because EPA determined that metals were of low concern at the Site. In order to assure protectiveness of human health and the environment, the collection of one round of groundwater, surface water and sediment samples for metals analysis is warranted for risk analysis prior to site closure.

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Groundwater Long-term groundwater monitoring to date has shown fluctuating concentrations of VOCs. Two (TCE and vinyl chloride) of the three Site groundwater cleanup targets were exceeded in several wells during several sampling rounds. Concentrations of four additional VOCs also exceeded their respective MCLs during the monitoring program. These VOCs included: tetrachloroethene, cis-1,2-dichloroethene, 1,2-dichloroethane, and chlorobenzene. VOCs have been detected (at the highest Site concentrations) in Wet Area 1 seep/standing surface water samples. Table 2 lists all VOCs detected on the Site in groundwater during Long Term Monitoring and indicates which compounds exceeded their MCLs. Tables 3 lists the wells and concentrations associated with the VOC contaminants that have exceedances above MCLs.

Sampling for SVOCs in groundwater was conducted in the autumn of 1991, 1992, and 1993. In 1994 it was agreed that SVOC sampling will be suspended until the ninth year of long-term monitoring. SVOCs are expected to remain at low levels and are not widely distributed at the Site. Monitoring has proven this to be true. SVOCs found include bis(2-ethylhexyl) phthalate, butylbenzylphthalate, 1,2-dichlorobenzene, di-n-octyl phthalate, 2-chlorophenol and phenol. Table 4 shows the wells at which SVOC concentrations have been found in groundwater. The table also indicated whether the compound has an MCL.

Limited sampling for PCBs has been conducted in groundwater at one well. Groundwater samples from MW-17B were tested for PCBs in the autumn of 1991 and 1992, but none were detected. No additional sampling for PCBs in groundwater is planned at this time.

The ROD specified a review of the management of migration portion of the remedy after two years of quarterly monitoring. Previously referred to as the Two Year Review. The monitoring results show that groundwater contamination above cleanup levels exists within the site boundary. Because of the fluctuating concentrations of VOCs, specific and significant trends in contaminant levels can not be identified. However based on the formation of degradation compounds it is believed that natural attenuation is occurring. Based on the available monitoring information to date contamination is not migrating off site above MCLs.

Surface Water VOCs were sampled quarterly from June 1991 to December 1992. Samples were not collected in March

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1993 due to frozen conditions, and in October 1993 due to dry conditions. VOCs were not detected in surface water samples, except for sporadic low levels (June 1991: toluene, 2.0 ppb; June 1992: acetone, estimated at 3 ppb, 1,4-Dichlorobenzene, estimated at 0.7 ppb, and 1,2,4-trimethylbenzene, estimated at 0.06 ppb). SVOCs were sampled in the autumn of 1991 and 1992. SVOCs were not detected in the surface water samples except for Bis(2-ethylhexyl) phthalate at 10 ppb and phenol at less than 0.7 ppb in 1991. No further surface water sampling except concurrent with seep sampling for VOCs, is planned.

Sediment Stream sediment samples were collected approximately 12 feet upgradient of the surface water sample location.

VOCs were sampled quarterly from June 1991 to March 1993. Results indicate VOCs are present only to a very limited extent, which was expected. Acetone was found in concentrations ranging from 65 ppb to 270 ppb and 2-butanone in concentrations ranging from 14 ppb to 89 ppb during the first two years of monitoring. Tetrachloroethene was detected in the June 1991 sediment sample at an estimated concentration of 2 ppb. Toluene was detected in the December 1991 sediment sample at an estimated concentration of 5 ppb. No VOCs were detected in the October, 1993 sediment samples, which was the final round of VOC sediment sampling. EPA split samples confirm acetone but at lower levels.

SVOCs were analyzed in the autumn of 1991 to 1993. Results indicate a very limited presence of SVOCs, which was expected. In 1991, bis (2-ethylhexyl) phthalate was detected at an estimated concentration of 130 ppb. In 1992, bis(2-ethylhexyl)phthalate was detected at estimated concentrations ranging from 110 ppb to 390 ppb and di-n-octylphthalate at an estimated concentration of 89 ppb.

PCBs were analyzed in the autumn of 1991, 1992, and 1993. No PCBs were detected in the Settling Parties sample collected in 1991, but the PCB Aroclor 1242 was detected in EPA samples ranging from 211 ppb to 274 ppb. In 1992, the PCB Aroclor 1242 was detected in the Settling Parties samples ranging from 250 ppb to 330 ppb. In 1992, the PCB Aroclor 1254 was detected in the EPA samples ranging from 63 ppb to 160 ppb. In 1993, the following PCB Aroclors were detected in the Settling Parties samples: 1016 at 110J ppb, 1248 at 14J and 43J ppb, and 1260 at 20J ppb. PCBs were not

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detected in the 1993 EPA split sediment sample. Sediment samples collected in December 1994 continue to show low levels of PCBs. The following aroclors were detected: 1016 at 59J ppb, 1248 at 61J ppb, and 1260 at 32J ppb.

IV. Review of Protectiveness

A separate Site Visit was not required for this five year review since EPA and Mass DEP personnel and representatives of EPA periodically visit the Site during long term monitoring activities. The Plymouth County Registry of Deeds was visited on October 4, 1994 to ensure that the Institutional Controls (deed restrictions) are still in place and have not been changed or superseded. The Site remains fenced and access is restricted.

Groundwater As previously discussed, the ARARs in the ROD identified three groundwater cleanup levels that had MCLs: benzene, trichloroethene, and vinyl chloride. The MCLs for the three groundwater cleanup targets have not been changed since the ROD was signed. Four additional VOCs have been identified which have exceeded their respective MCLs during the Long Term Monitoring program and would also be ARARs. These are: tetrachloroethene, cis-1,2-dichloroethene, 1,2-dichloroethane, and chlorobenzene.

These contaminants are in exceedance of their MCLs onsite and the current monitoring program is adequate to show that no contaminants are migrating offsite above MCLs at this time. The Institutional Controls (deed restrictions) are still in place and provide for protectiveness by restricting the use of groundwater on the Site. The surrounding area has no known user of groundwater for drinking water purposes. When the Settling Parties notify EPA that the cleanup goals have been attained, a complete risk assessment using all data at that time for all compounds will be done to determine if the Site is protective.

Soils PCBs and Polycyclic Aromatic Hydrocarbons (PAHs) are the two major contaminants of concern for which soil cleanup levels were set. The ROD set the PCB cleanup level at 9 ppm. During the remediation a cleanup level of 3 ppm for all semi-volatiles, including PAHs, was set for Upland Area 4 only. In the Endangerment Assessment (EA), risks to human health via exposure to contaminated soils were evaluated for the dermal absorption pathway only. At the time the EA was prepared, the dermal route was considered the only significant exposure pathway. More recent

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information indicates that the ingestion pathway, i.e., incidental ingestion of soil, is significant.

Also new information indicates that the dermal pathway can be quantitatively evaluated for PCBs but not PAHs. EPA Guidance, Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/-11B, January 1992 indicates that sufficient data for evaluating dermal adoption of contaminants from soil is available for very few chemicals. Data on dermal absorption of PCBs is available; similar data for PAHs is not.

Therefore the risks associated with exposure to PCBs (ingestion and dermal contact) and PAHs (ingestion only) were calculated for both workers and trespassers. Risks to future workers, which were not calculated in the EA are somewhat higher than risk to trespassers. The incremental cancer risk associated with the soil cleanup levels are shown in the table below.

Incremental Cancer risks Associated with Cleanup Levels

<u>Chemical of Concern</u>	<u>Cleanup Level</u>	<u>Worker</u>	<u>Trespasser</u>
PCBs (ingestion & dermal)	9 ppm	2×10^{-5}	5×10^{-6}
PAHs (ingestion only)	3 ppm *	5×10^{-6}	1×10^{-6}

* Separate toxicity values for each carcinogenic PAH are now available; previously all carcinogenic PAHs were conservatively assumed to have the same carcinogenic potency. The risks associated with the 3 ppm benzo (a) pyrene, the most potent of the carcinogenic PAHs, are shown here.

The cleanup levels for PCBs and PAHs in soil were met in the Remedial Action and are considered protective.

Ecological Risk Evaluation Ecological risk was evaluated in a Wetlands Assessment (E.C. Jordan, April 1987). This study concluded that aquatic organisms in the wet areas were at risk from concentrations of PCBs, benzene, chlorobenzene, bis(2-ethylhexyl)phthalate, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc. The majority of the risk was reportedly due to the presence of PCBs, particularly those in the area now referred to as Wet Area 1. The range of PCB levels detected in sediments was from non-detect to 1.3 ppm.

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PCBs The presence of PCBs was further evaluated in the Pre Design Study with the additional collection of sediment samples on and off the Site in accordance with communication from the National Oceanic and Atmospheric Administration (NOAA). This study found PCBs in sediment in the outlet of Wet Area 1 and the drainage canal (downstream of the Wet Area 1 outlet) at concentrations of 1.2 ppm and 1.28 ppm, respectively. The furthestmost downstream sample, which was taken at the terminus of the drainage canal west of Route 24, had a concentration of 0.22 ppm. NOAA reviewed these data and stated in 1989 that its "target level for PCBs in sediments utilized by resources of trust is 0.1 to 1.0 ppm. Although these three [outlet stream and drainage canal] samples are above those target levels, NOAA resources have no possibility of reaching within one kilometer of the Site." However, NOAA cited concern with mobilization of PCB-contaminated sediments if they are transported from the drainage canal and through the swamp to Lake Nippenicket. As a result, NOAA "decided that sediments at the terminus of the [drainage] canal should not contain over 1 ppm of PCBs." NOAA has recently confirmed their earlier statement that the contaminant levels of concern at the Site have not changed. The Long Term Monitoring of sediments at the outlet to Wet Area 1 have shown concentrations of PCBs below 1 ppm. Thus there appears to be no migration of PCBs from the Wet Area through the outlet to the drainage canal. This conclusion is further supported by the fact that clean soil was placed in Wet Area 1 during remediation, thus there is no known source of PCB contamination at the surface in Wet Area 1.

Surface Water The concentrations of VOCs detected in surface water samples collected from the outlet stream of Wet Area 1 fall below current Ambient Water Quality Criteria (AWQC). The intermittent seep/surface water sampling in the northwest corner of Wet Area 1 has shown one sample to have exceeded the chronic AWQC for tetrachloroethene. The flow of water from this intermittent seep is very small and is not considered an ecological concern at this time. Continued monitoring of this intermittent seep is recommended and when a seep sample is collected a surface water sample at the outlet to the wet area is recommended to be taken. There is no ecological risk in surface water from VOCs.

There was a minor SVOC exceedance of the chronic AWQC for bis (2-ethylhexyl) phthalate in EPA's 1991 surface water sample. The concentration detected was 7 ppb, while the chronic AWQC value is noted to be a "lowest observed effects

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level" of 3 ppb. This sole surface water exceedance is not likely to contribute to an ecological risk.

Metals were of concern in the Wetlands Assessment because some metals concentrations in surface water samples exceeded AWQC. Except for lead and silver, all of the metals exceedances were slight. AWQC for the metals of concern have not been changed since the 1987 Wetlands Assessment. EPA determined during the design that metals were of low concern at the site. No metals data have been collected since the Wetlands Assessment, but it is recommended that surface water, groundwater and sediment samples be analyzed for metals, including hardness dependent parameters, for use in risk analysis prior to Site closure.

Sediment Baseline sediment criteria have not been widely developed and accepted for VOCs. As stated earlier, the common laboratory contaminants acetone and 2-butanone were detected in sediment samples, but are not expected to be Site contaminants. The other VOCs (tetrachloroethene and toluene) were detected at or near the detection limit. These low concentrations are not likely to contribute to an ecological risk.

The Wetlands Assessment compares the concentration of contaminants in the sediment to aqueous toxicity values. It correctly states that actual SVOC exposure concentrations may be lower in the sediment pore water than those levels reported for sediment samples. This is due to preferential partitioning of these contaminants onto sediment particles. The 1991 and 1992 sediment samples showed concentrations of bis (2-ethylhexyl) phthalate (BEPH) that are two orders of magnitude below the maximum concentration detected in the Remedial Investigation (RI). An ecological risk assessment would not select this compound as a contaminant of concern as was the case in 1986. One other SVOC was detected in the sediment, di-n-butylphthalate, in 1992 at a level that is an order of magnitude lower than the BEPH. Di-n-butylphthalate had not been detected in the RI and thus was not evaluated. If it were evaluated, it is expected that it would be rated with a similar level of concern to BEPH. No SVOCs were detected in the 1993 sediment sample. The SVOC compounds are not expected to contribute to an ecological risk at the Site.

IV. Summary and Recommendations.

The primary purpose of this five-year review is to evaluate whether the remedial action selected for and implemented at the Site remains protective of public health and the environment. The review focused on both the effectiveness of the remedy and on the specific performance levels established in the ROD and during remediation. The review verified that the performance levels were met for soils.

Four additional compounds have been identified in the onsite groundwater at levels above MCLs. However there is no migration beyond the Site boundary above MCLs and the compounds are expected to naturally attenuate consistent with the ROD. Therefore the protectiveness of the remedy is not brought into question.

A. The chain link fence surrounding the Site appears to be in good condition, except for slight damage sustained by the outer Site gate and damage observed at the Site's southwest corner. However, no evidence of trespassing has been observed during regular visits to the Site by EPA the Commonwealth. The locks on the inner and outer Site gates are in good condition, and the monitoring well locks are replaced as needed. The southwest corner of the chain link fence and the outer Site gate should be repaired, however the fence is protective.

B. The ecological risk assessment, which was part of the Endangerment Assessment, concluded that aquatic organisms in the wet areas were at risk from concentrations of PCBs, benzene, chlorobenzene, bis (2-ethylhexyl)phthalate and several metals. The majority of the risk was reportedly due to PCBs. Current conditions, however, appear to be protective of ecological receptors at the Site and surrounding areas, provided the following items are addressed in the continued Long Term Monitoring: 1. Continued PCB sediment sampling is not warranted based on the PCB sediment sampling in December 1994. However, NOAA has requested that PCB sediment sampling be performed for future five year reviews; 2. In light of the AWQC exceedance at the intermittent seep sampling location, the collection of intermittent seep/standing water samples from the northwest corner of Wet Area 1 should continue. In addition, a resumption of the collection of surface water samples at SW-8 for VOC analysis is recommended whenever seep/standing water samples are collected from Wet Area 1 to check for possible migration of contaminants.

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C. Because EPA determined that metals were of low concern at the Site, analyses for metals have not been included in the long-term monitoring program (although they were called for in the ROD during initial sampling). Due to the ROD's requirement for the initial inclusion of metals analyses during long-term monitoring, the collection of a round of groundwater and surface water samples for metals analysis will be required prior to site closure.

D. The Site monitoring wells are in good condition and are functioning properly. Long-term groundwater monitoring began in June 1991 and is being performed according to the approved Plan, except for the suspension of SVOC sampling from the fourth through the eighth years and the change to semi-annual sampling for years 3, 4, and 5. With the addition of a well cluster in 1994, it appears that the configuration of the on-site monitoring network is adequate to monitor on-site groundwater conditions. The sampling of seep/standing water should continue. In addition, it is too early to evaluate the achievement of groundwater cleanup target levels given the ROD's 15 to 20 year time frame for natural attenuation.

The deed restrictions are still in place and insure the site is protective from use of existing groundwater that exceeds clean up levels.


E. A higher level of review (e.g., Level II) in accordance with OSWER Directive 9355.7-02 is not considered necessary at this time.

IV. Statement on Protectiveness.

I certify that the remedy selected for this Site remains protective of human health and the environment.

V. Next Five Year Review.

The next five-year review will be conducted by the year 2000, which will fall in Year 9 of the Long-Term Monitoring program.

 6/29/95

Dennis Huebner, Chief
Superfund I Branch, Region I

TABLE 1
REMEDIATION CRITERIA FOR SOIL AND GROUNDWATER
FIVE YEAR REPORT – CANNONS BRIDGEWATER SITE

Contaminant	Final Design Soil Cleanup Level (1)	Groundwater Standard 1989 (2)	Groundwater Standard 1994 (3)
UPLAND AREA SOILS			
Trichloroethene	500 ppb	MCL = 5 ppb	MCL = 5 ppb
1,1-Dichloroethene	500 ppb	MCL = 7 ppb	MCL = 7 ppb
Toluene	1000 ppb	PMCLG = 2000 ppb	MCL = 1000 ppb
Xylenes	1000 ppb	PMCLG = 440 ppb	MCL = 10,000 ppb
Chlorobenzene	1000 ppb	PMCLG = 60 ppb	MCL = 100 ppb
Tetrachloroethene	500 ppb	PMCLG = 0 ppb	MCL = 5 ppb
Benzene	1000 ppb	MCL = 5 ppb	MCL = 5 ppb
Ethylbenzene	1000 ppb	Not Specified	MCL = 700 ppb
1,2 Dichlorobenzene	1000 ppb	Not Specified	MCL = 600 ppb
1,3 Dichlorobenzene	1000 ppb	Not Specified	MCL = 600 ppb
1,4 Dichlorobenzene	1000 ppb	Not Specified	MCL = 75 ppb
1,1,1-Trichloroethane	1000 ppb	Not Specified	MCL = 200 ppb
4-Methylphenol	3000 ppb	Not Specified	Not Specified
2-Methylnaphthalene	3000 ppb	Not Specified	Not Specified
Dimethylphthalate	3000 ppb	Not Specified	Not Specified
Di-n-butylphthalate	3000 ppb	Not Specified	Not Specified
Phenol	3000 ppb	Not Specified	Not Specified
N-Nitrosodiphenylamine	3000 ppb	Not Specified	Not Specified
Bis (2-ethylhexyl)phthalate	3000 ppb	Not Specified	Not Specified
Naphthalene	3000 ppb	Not Specified	Not Specified
Butylbenzylphthalate	3000 ppb	Not Specified	MCL = 100 ppb
PCBs (total)	9000 ppb (4)	Not Specified	MCL = 0.5 ppb
Chromium	Not Specified	Not Specified	MCL = 100 ppb
WET AREA SOILS			
1,1-Dichloroethene	160 ppb	MCL = 7 ppb	MCL = 7 ppb
Trichloroethene	120 ppb	MCL = 5 ppb	MCL = 5 ppb
Benzene	120 ppb	MCL = 5 ppb	MCL = 5 ppb
Vinyl Chloride	50 ppb	MCL = 2 ppb	MCL = 2 ppb
Tetrachloroethene	120 ppb	PMCLG = 0 ppb	MCL = 5 ppb
PCBs (total)	9000 ppb (4)	Not Specified	MCL = 0.5 ppb
Chromium	Not Specified	Not Specified	MCL = 100 ppb

Notes:

(1) – U.S. EPA, Superfund Site Interim Close Out Report, Cannons Engineering Corporation Site, September 30, 1991

(2) – Canonic Environmental, Groundwater Modeling Study Report, June 1989

(3) – U.S. EPA, Office of Water, "Drinking Water Regulations and Health Advisories", EPA 822-R-94-001, May 1994

(4) – U.S. EPA, "Record of Decision – Cannons Engineering Site", March 31, 1988

MCL = Maximum Contaminant Level

PMCLG = Proposed Maximum Contaminant Level Goal

TABLE 2
VOCS DETECTED IN GROUNDWATER DURING LONG-TERM MONITORING
FIVE-YEAR REPORT - CANNONS BRIDGEWATER SITE

Compound	Concentration Exceeded MCL
cis-1,2-Dichloroethene	X
Chloroform	
Tetrachloroethene	X
Tetrahydrofuran	
1,1,1-Trichloroethane	
Methylene Chloride	
Vinyl Chloride	X
1,1-Dichloroethane	
Trichloroethene	X
Chlorobenzene	X
Acetone	
1,1,2-Trichloroethane	
trans-1,2-Dichloroethene	
Benzene	
1,2-Dichlorobenzene	
Ethylbenzene	
Toluene	
Xylenes	
Chloroethane	
1,2-Dichloroethane	X
1,4-Dioxane	
Carbon Disulfide	
1,3-Dichlorobenzene	
Trichlorofluoromethane	
sec-Butylbenzene	
1,1-Dichloroethene	

TABLE 3
MCL EXCEEDANCES DURING LONG-TERM MONITORING
FIVE-YEAR REPORT - CANNONS BRIDGEWATER SITE

Compound	MCL (ppb)	Monitoring Well	Concentration ¹ (ppb)	Collected By	Sample Round
Tetrachloroethene	5	MW-1	5.5	RP	Q3/91
		MW-5	5.5J	RP	Q3/91
		Seep-SB	2200	RP	Q1/92
		Seep-1	130	RP	Q1/93
			100J/110J	EPA	Q1/93
		Seep-2	52	EPA	Q1/93
cis-1,2-Dichloroethene	70	MW-8	550	RP	Q3/91
			120	RP	Q1/92
			83	RP	Q3/92
			85	RP	Q4/92
			410	RP	Q3/94
		Seep-SB	2200	RP	Q1/92
		Seep-1	2500	RP	Q1/93
			1300J/1600J	EPA	Q1/93
		Seep-2	1700	RP	Q1/93
			2600J	EPA	Q1/93
		Seep-SA	880	RP	Q1/94
			710J	EPA	Q1/94
Vinyl Chloride	2	MW-8	54	RP	Q3/91
			7.1	RP	Q4/91
			6/6	EPA	Q4/91
			23	RP	Q1/92
			5.1J	RP	Q2/92
			7/6	EPA	Q2/92
			27J	RP	Q3/92
			20J	RP	Q4/92
			8.7	RP	Q1/93
			4J	RP	Q1/94
			38	RP	Q3/94
		MW-11	12	RP	Q2/91
			6	EPA	Q2/91
			3	EPA	Q3/91
			34J	RP	Q3/93
			12	RP	Q3/94
		MW-12	2J	RP	Q3/93

TABLE 3
MCL EXCEEDANCES DURING LONG-TERM MONITORING
FIVE-YEAR REPORT - CANNONS BRIDGEWATER SITE

Compound	MCL (ppb)	Monitoring Well	Concentration ¹ (ppb)	Collected By	Sample Round
Vinyl Chloride (cont'd.)		MW-15B	3J	EPA	Q3/91
			2.8	RP	Q4/91
		MW-15C	4.0	RP	Q2/91
			3.0	RP	Q3/91
			4J	EPA	Q3/91
			3.7	RP	Q4/91
			3.0/2.4	RP	Q1/92
			2.5	RP	Q2/92
			2.1	RP	Q3/92
			2.1/2.3	EPA	Q3/92
			2.4J	RP	Q1/93
		MW-17A	2/3	EPA	Q3/91
		Seep-1	15J/28J	EPA	Q1/93
		Seep-2	61J	EPA	Q1/93
		Seep	3.3	EPA	Q1/94
Trichloroethene	5	MW-8	36	RP	Q3/91
			6/6	EPA	Q3/91
			7.7	RP	Q1/92
			11	RP	Q3/92
			13	RP	Q4/92
			11J	RP	Q3/94
		MW-11	7.0	RP	Q2/91
		Seep-SB	850	RP	Q1/92
		Seep-1	560	RP	Q1/93
			450J/330J	EPA	Q1/93
		Seep-2	320	RP	Q1/93
			750J	EPA	Q1/93
1,2-Dichloroethane	5	MW-15B	5.5	RP	Q3/91
			6.1	RP	Q4/91
			5.4	RP	Q1/93
		MW-15C	8.8	RP	Q3/91
			6J	EPA	Q3/91
			7.9	RP	Q4/91
			7.9/7.3	RP	Q1/92
			6.0	RP	Q2/92
			6.5	RP	Q3/92

TABLE 3
MCL EXCEEDANCES DURING LONG-TERM MONITORING
FIVE-YEAR REPORT - CANNONS BRIDGEWATER SITE

Compound	MCL (ppb)	Monitoring Well	Concentration ¹ (ppb)	Collected By	Sample Round
1,2-Dichloroethane (cont'd.)			6.4/6.7	EPA	Q3/92
			7.6	RP	Q1/93
			5	RP	Q1/94
			5.4	EPA	Q1/94
Chlorobenzene	100	MW-17A	210/180	RP	Q3/91
			170J/170J	EPA	Q3/91
			190	RP	Q4/91
			240	EPA	Q4/91
			350	RP	Q1/92
			310/320	RP	Q2/92
			560	RP	Q1/93
			310	RP	Q1/94
		MW-17B	280	RP	Q2/91
			190/200	EPA	Q2/91
			500	RP	Q3/91
			310	RP	Q4/91
			550	RP	Q1/92
			610	RP	Q2/92
			480	RP	Q3/92
			280	EPA	Q3/92
			420J	RP	Q4/92
			940J	RP	Q1/93
			230/220	RP	Q3/93
			180J	EPA	Q3/93
			360	RP	Q1/94
			170	RP	Q3/94

1) Two concentration values indicate a duplicate sample pair. Concentration values with a J indicate estimated values.

TABLE 4
SEMI-VOCS DETECTED IN GROUNDWATER DURING LONG-TERM MONITORING
FIVE-YEAR REPORT - CANNONS BRIDGEWATER

Compound	MCL (ppb)	Monitoring Well	Concentration ¹ (ppb)	Collected By	Sample Round
Bis (2-ethylhexyl)phthalate	None	MW-1	8	RP	Q3/91
		MW-1	6J	RP	Q3/93
		MW-3	0.6J	RP	Q3/91
		MW-3	7J	RP	Q3/93
		MW-4A	0.7J	RP	Q3/91
		MW-4B	0.7J	RP	Q3/91
		MW-7	3J	RP	Q3/91
		MW-7	6J	RP	Q3/93
		MW-11	3J	RP	Q3/91
		MW-12	1J	RP	Q3/91
		MW-13B	0.6J	RP	Q3/91
		MW-15A	8J	RP	Q3/93
		MW-15B	6J	RP	Q3/93
		MW-15C	16	RP	Q3/93
		MW-16A	1J	RP	Q3/91
		MW-16B	1J	RP	Q3/91
		MW-16B	16	RP	Q3/93
		MW-17A	1J/0.6J	RP	Q3/91
		MW-17A	27	RP	Q3/93
		MW-17B	22/25	RP	Q3/93
		MW-17B	50J/30J	EPA	Q3/91
Butylbenzylphthalate	100	MW-1	1J	RP	Q3/91
		MW-6A	1J	RP	Q3/91
		MW-17A	12J	EPA	Q3/91
1,2-Dichlorobenzene	600	MW-17A	3J/ND	RP	Q3/91
		MW-17A	2J	RP	Q3/92
		MW-17B	6	RP	Q3/91
		MW-17B	8J/9J	EPA	Q3/91
		MW-17B	3J	RP	Q3/92
Di-n-octylphthalate	None	MW-1	1J	RP	Q3/92
		MW-3	3J	RP	Q3/92
		MW-4B	3J	RP	Q3/92
		MW-6C	5J	RP	Q3/92
		MW-7	5J/2J	RP	Q3/92
		MW-8	3J	RP	Q3/92

TABLE 4
SEMI-VOCS DETECTED IN GROUNDWATER DURING LONG-TERM MONITORING
FIVE-YEAR REPORT - CANNONS BRIDGEWATER

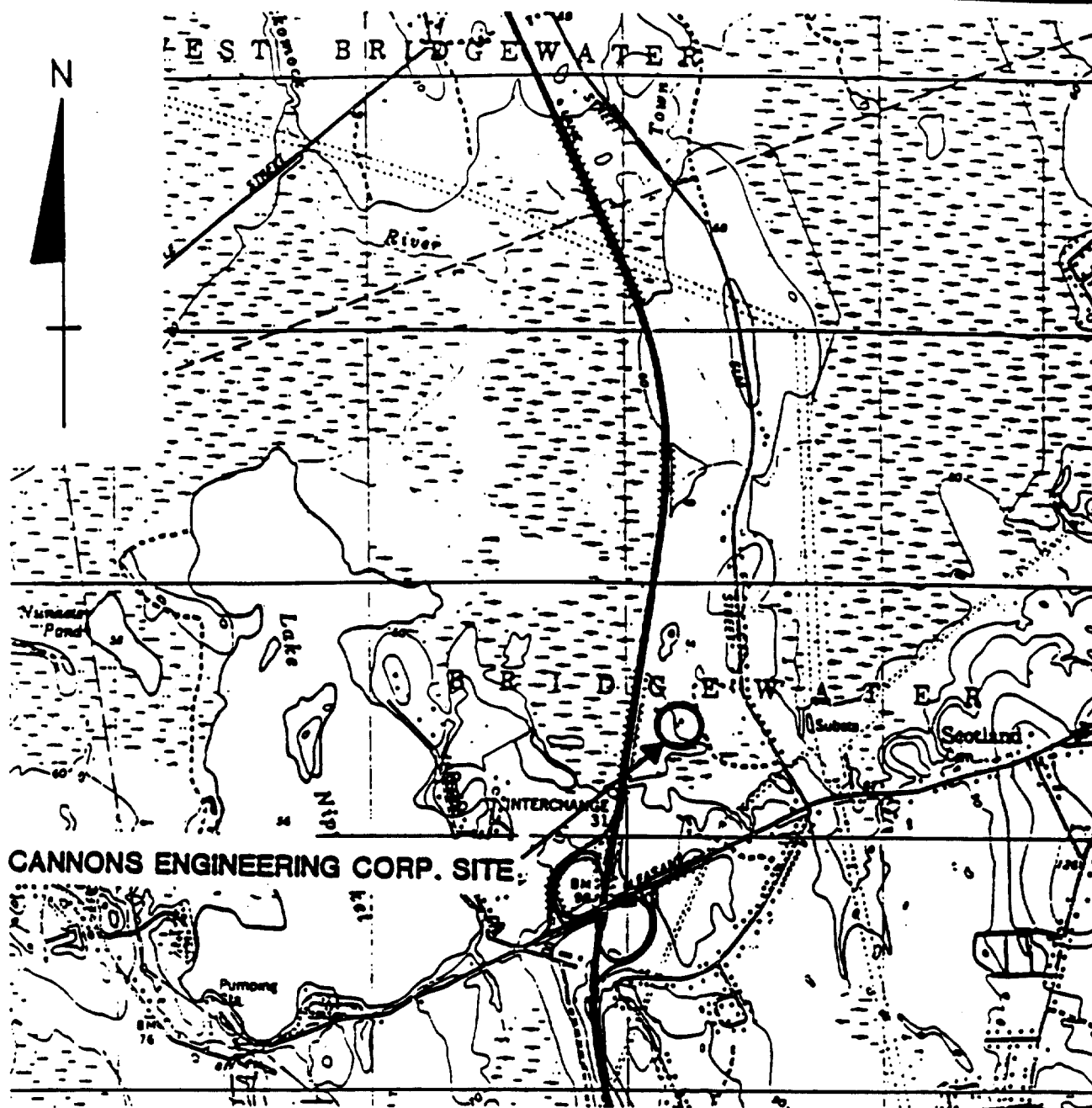
Compound	MCL (ppb)	Monitoring Well	Concentration ¹ (ppb)	Collected By	Sample Round
Di-n-octylphthalate(Cont'd)		MW-11	2J	RP	Q3/92
		MW-12	9J/5J	RP	Q3/92
		MW-13A	200J	RP	Q3/92
		MW-13B	1J	RP	Q3/92
		MW-15A	1J	RP	Q3/92
		MW-17A	12	RP	Q3/92
		MW-17B	5J	RP	Q3/92
2-Chlorophenol	None	MW-17B	3J	RP	Q3/92
Phenol	None	MW-4A	1J	RP	Q3/91
		MW-5	2J/1J	RP	Q3/91
		MW-7	0.6J	RP	Q3/91
		MW-12	0.7J	RP	Q3/91
		MW-15B	1J	RP	Q3/91

1) Two concentration values indicate a duplicate sample pair. Concentration values with a J indicate estimated values.

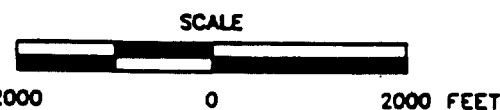
DRAWING NUMBER 88-016-A14

CHECKED BY
9-27-88

DRAWN BY



CANNONS ENGINEERING CORP. SITE



**SITE
LOCATION MAP
BRIDGEWATER SUPERFUND SITE
BRIDGEWATER, MASSACHUSETTS**

REFERENCES:

- E. C. JORDAN CO. CONSULTING ENGINEERS "SITE LOCATION MAP" PROJECT No. 5101-44
- USGS 7.5 MINUTE SERIES, TAUNTON QUAD, PHOTOREVISED 1977

10-10-88	ADDED REFERENCE, AGENCY REVIEW	CHE		
9-27-88	CLIENT REVIEW	M.A.M.		

No.	DATE	ISSUE NUMBER / REVISIONS	DRN. BY	CHK'D BY	APP'D BY	DATE: 9-27-88	FIGURE 1	DRAWING NUMBER 88-016-A14
			DATE	DATE	DATE	SCALE: AS SHOWN		

